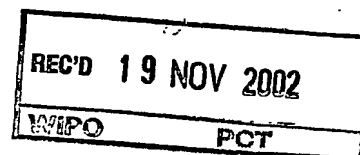


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Patent Office
Canberra

I, JULIE BILLINGSLEY, TEAM LEADER EXAMINATION SUPPORT AND SALES hereby certify that annexed is a true copy of the Provisional specification in connection with Application No. PR 8679 for a patent by THE UNIVERSITY OF NEWCASTLE RESEARCH ASSOCIATES LIMITED as filed on 05 November 2001.



WITNESS my hand this
Twelfth day of November 2002

J. Billingsley

JULIE BILLINGSLEY
TEAM LEADER EXAMINATION
SUPPORT AND SALES

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AUSTRALIA

PATENTS ACT 1990

PROVISIONAL SPECIFICATION

FOR THE INVENTION ENTITLED:-

"LIQUID DISPENSER"

The invention is described in the following statement:-

This invention relates to a liquid dispenser and has been devised particularly though not solely for low flow rate dispensing of medical liquids for intravenous drip applications.

There are many situations where it is desirable to be able to provide a controlled low flow rate delivery of a liquid from a compact, portable and reliable device. In particular, 5 there are many medical situations in which it is desirable to supply liquids such as intravenous drip fluids for patients in a reliable and easily regulated device which at the same time is compact and portable so that it is convenient for the patient to use.

In the past, low flow rate dispensing devices, and in particular intravenous drip supply devices, have been provided in a number of different formats including the 10 conventional gravity feed bag which is typically hung from a support rack located above the patient. Such devices are cumbersome for the patient to use, requiring the feeding of a tube from a fixed and elevated situation to the point of dispensing on the patient and furthermore they are not readily portable.

Alternative portable devices for the supply of intravenous drip fluids for patients 15 have included a round bag with a spring loaded container which is expensive to manufacture, incorporates a screw mechanism which is difficult to load for some patients, and which does not always ensure a linear delivery of fluid. Other devices include an elastomer device incorporating a container with a balloon which is fully disposable and typically loaded by a hypodermic syringe. These devices are expensive to use due to their 20 "one use" configuration, have limitations on the volume of fluid contained (typically 50 millilitres) and must be filled by a health care professional. There are also syringe drivers, which are typically powered by electric motors and again are expensive both to provide and maintain.

There are also many other non-medical applications such as the supply of lubricating 25 fluids to machinery, the dosing of antibacterial fluids into cooling towers or air

conditioning systems, and other similar applications which require a compact and reliable apparatus for controlled rate low flow dispensing of liquids.

Accordingly, the present invention provides apparatus for controlled rate dispensing of a liquid contained in a flexible bag, said apparatus including a substantially gas tight
5 chamber adapted to contain the bag full of liquid, an outlet from the chamber adapted to receive an outlet conduit communicating with the interior of the bag and seal the outlet conduit to the chamber, a source of gas arranged to supply gas under pressure to the interior of the chamber, and a pressure regulator arranged to control the gas pressure within the chamber.

10 Preferably, the pressure regulator is arranged to regulate the flow of gas from the source of gas to the chamber.

Preferably, the source of gas comprises a pressure vessel of pre-compressed gas.

Alternatively, the source of gas comprises a reservoir pressurised by a pump.

Preferably, the flexible bag is a medical supply bag of the type used to supply
15 intravenous drip fluids for patients.

Preferably, the flexible bag comprises a so-called Baxter bag.

Preferably, the apparatus is arranged to dispense liquids at a controlled low flow rate.

For example, the low flow rate is less than 50 millilitres per hour (ml/hr).

Preferably, the chamber is provided in a relatively flat cuboidal configuration having
20 a depth significantly less than the length or width of the chamber.

Preferably, the pressure vessel and gas regulator are located alongside the chamber in a common housing arranged such that the pressure vessel and gas regulator are contained within the depth of the housing.

Preferably, the housing is provided with a support strap adapting the housing to be
25 worn by a patient.

Notwithstanding any other forms that may fall within its scope, one preferred form of the invention will now be described by way of example only with reference to the accompanying drawings in which:

Fig. 1 is a cross-sectional plan view through a liquid dispensing apparatus according
5 to the invention,

Fig. 2 is a front view of the apparatus shown in Fig. 1,

Fig. 3 is a cross-sectional elevation on the line AA of Fig. 1, and

Fig. 4 is a similar view to Fig. 1 showing a flexible bag containing liquid in place
within the chamber of the apparatus.

10 In the preferred form of the invention, a liquid dispensing apparatus particularly
designed for dispensing intravenous drip fluids to patients is constructed as follows,
although it will be appreciated that the apparatus can be used for other applications and
provided in other configurations.

The apparatus comprises a substantially gas tight cuboidal chamber 1 typically
15 defined by solid plastics components formed for example of acrylic or polycarbonate
materials. The plastics components define side walls 2 and 3 to the chamber, an end wall
4, and a removable cap wall 5. The chamber is completed by face plate portions 6 and 7
and formed into a gas tight configuration by the use of O-ring seals 8.

The chamber 1 is sized to receive a full medical supply bag such as a Baxter bag
20 shown in Fig. 4 at 9.

The Baxter bag is typically provided with a filling conduit 10 which is
accommodated within a recess 11 in the cap 5 and an outlet conduit 12 which is located
within an outlet 13 from the chamber 1 which in turn is provided with a seal 14 arranged to
seal the outer periphery of the outlet conduit 12 to the cap 5, thus maintaining the gas tight
25 nature of the chamber 1.

The outlet 12 may be connected to the ultimate dispensing point e.g. to an intravenous drip needle by way of the commonly known flexible tube (not shown).

The apparatus is further provided with a source of gas in the form of a pressure vessel 15 which is similar to the type used to provide pressurised gas such as CO₂ or air for an inflatable life jacket or other similar uses. There is also provided a pressure regulator 16 arranged to regulate the supply of gas from the pressure vessel 15 and feed that gas into chamber 1 through conduit 17 located within the housing such that the gas pressure within chamber 1 is maintained at a relatively constant and predetermined level.

The pressure regulator 16 may take any known form, although typically comprises the compression spring controlled piston device shown in Figs. 1 and 4 using needle valves to regulate and control the gas supply pressure. It will be appreciated however that many different types of pressure regulators are well known and could be substituted for the regulator shown at 16.

It is an advantageous feature of the preferred embodiment of the invention that both the pressure vessel 15 and the gas regulator 16 can be located alongside the chamber 1 as shown in Figs. 1 and 4 with the supply and regulation devices contained within the overall depth of the housing as can be clearly seen in Fig. 2. This results in a compact and easy to handle apparatus while still retaining good access to the mounting for the pressure vessel 15, enabling the pressure vessel to be easily changed and replaced as needed.

In use, the pressure regulator 16 is either pre-calibrated, or adjusted, to provide a supply of gas through conduit 17 into chamber 1 calculated to maintain a predetermined gas pressure within chamber 1 regardless of the volume of fluid contained at any point in time in the bag 9. In this manner, the dispensing force on the liquid within the bag 9 is constant over the full range of the bag, from full to empty, ensuring a constant flow rate of fluid from the bag through the outlet conduit 12, against the back pressure of any

regulating device that may be installed in the supply line connected to the outlet conduit. This enables an extremely accurate flow rate of liquid to be achieved over the entire dispensing range from the bag 9.

It is a further feature of the invention, that the gas pressure within the chamber 1 enables all of the liquid within the bag to be dispensed, again providing accurate measurement of total fluids dispensed to a patient, and providing efficient utilisation of all liquid within the bag.

Because the housing formed by the members 2, 3, 4, 5, 6, and 7, and the further housing 18 supporting the pressure regulator and pressure vessel, are arranged in a relatively flat cuboidal configuration having a depth significantly less than the length or width of the chamber, the resulting apparatus is very compact and easy to wear by a patient. The apparatus can easily be provided with a support strap in the form of either a waistband or a shoulder strap (not shown), adapting the housing to be worn by a patient in a position where it is extremely easy and convenient to lead a supply tube from the outlet conduit 12 to the dispensing point on the body of the patient.

Although the apparatus has been described with the source of gas as being a pressure vessel of pre-compressed gas, it will be appreciated that other alternatives could be used such as a hand pump pressurised reservoir contained within or connected to the apparatus. Similarly, other configurations of pressure regulator could be used either to regulate the supply between the source of gas and the chamber as shown in the accompanying drawings or as a pressure relief valve in the chamber to control the build up of pressure within the chamber.

DATED this 5th Day of November, 2001

THE UNIVERSITY OF NEWCASTLE RESEARCH ASSOCIATES LIMITED
Attorney: JOHN D. FORSTER
Fellow Institute of Patent and Trade Mark Attorneys of Australia
of BALDWIN SHELSTON WATERS

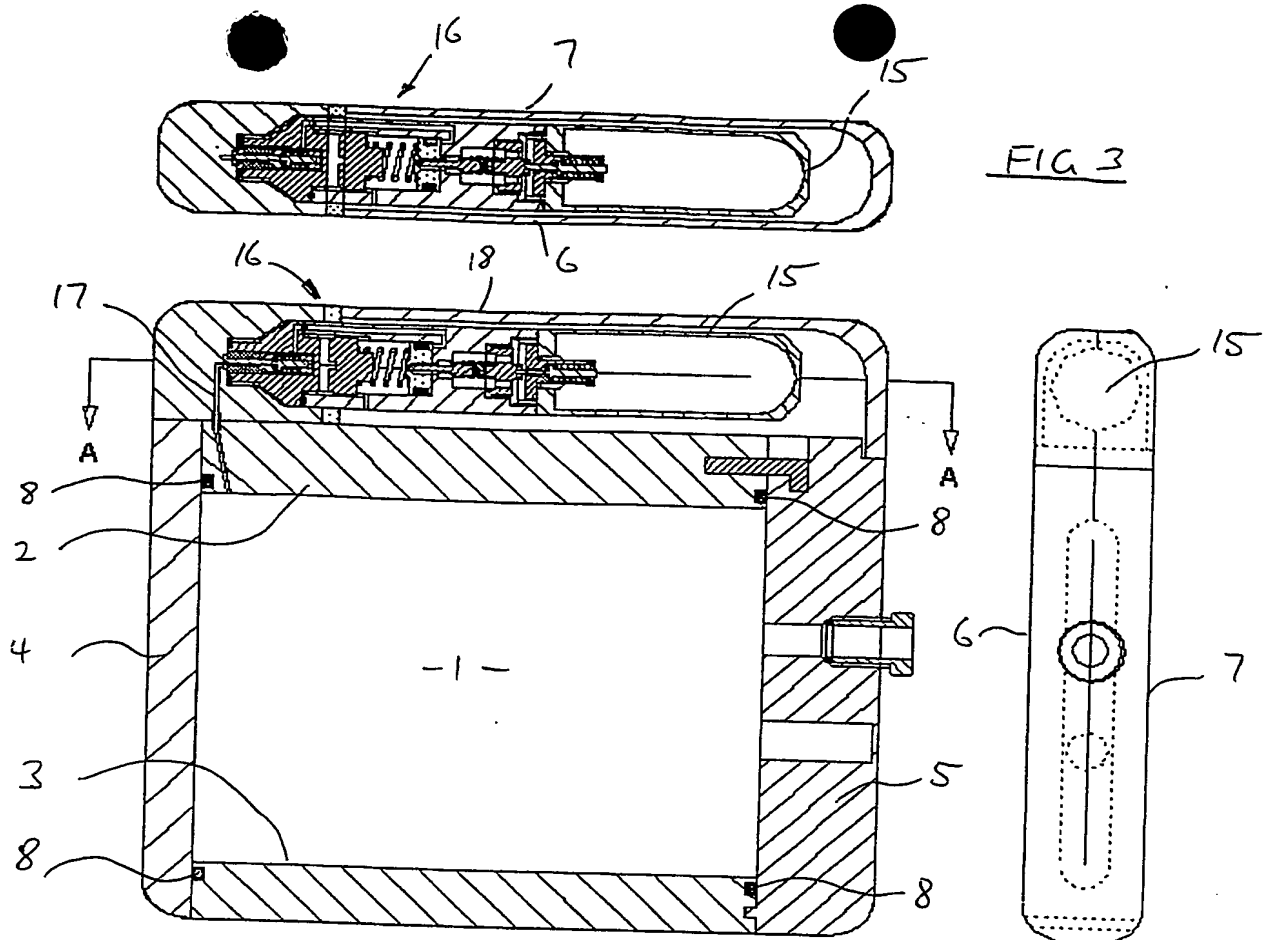


FIG 1

FIG 2

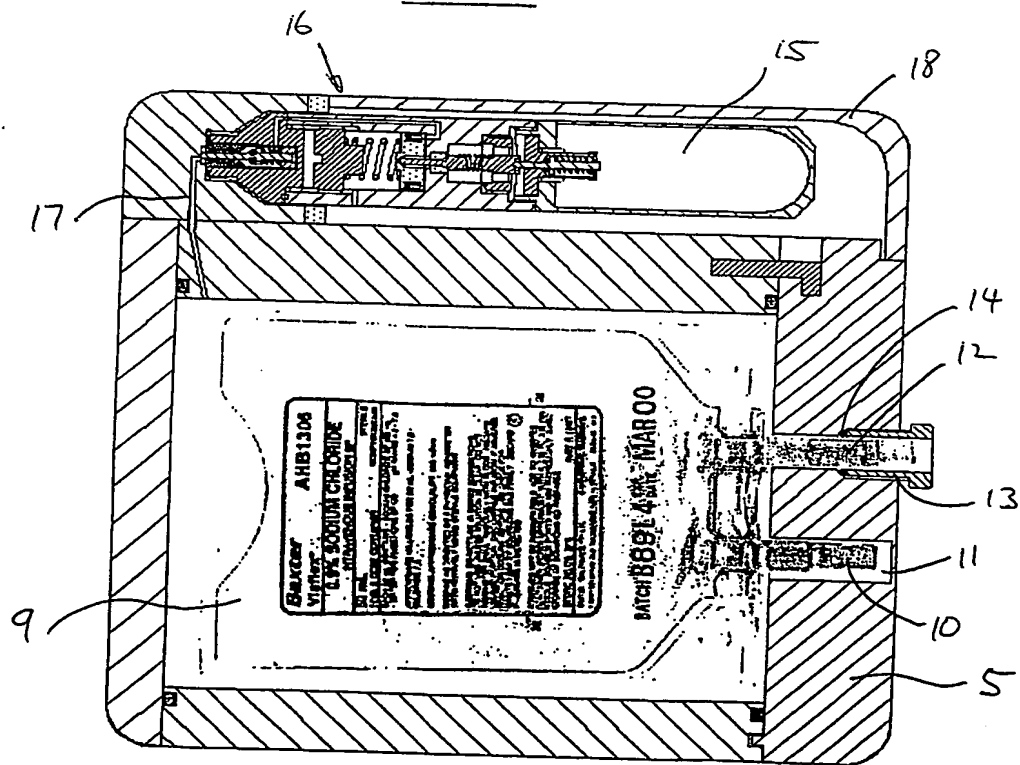


FIG 4